SOUTHERN CALIFORNIA BOTANISTS FOUNDED 1927

CROSSOSOMA

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont, CA 91711

Crossosoma Vol. 7, No. 1 February, 1981
Editor: M. Chesebro

RARE PLANT SPECIES IN THE BIG BEAR LAKE BASIN, SAN BERNARDINO MOUNTAINS

By Timothy P. Krantz

Big Bear Lake is situated in the San Bernardino Mountains of Southern California. It lies in an east-west trending valley at an elevation of 6,720 feet, surrounded by peaks of 7,000-10,000 feet. Once a marshy montane valley roamed by grizzly bears and gold miners, the present Big Bear Lake was created by the construction of a dam at the west end in 1884. At the east end of the valley is Baldwin Lake, a shallow alkaline natural lake fed by springs and runoff water. It has no natural outlet. Parallel to and north of Big Bear Valley is Holcomb Valley. North of Holcomb Valley the mountains drop steeply to the Mojave Desert floor 5,000 feet below.

In the basin of Big Bear Lake a combination of geology, topography, and desert-montane climate have all conspired to create one of the most diverse floras in the United States. Indeed evolution has run rampant here. The San Bernardino National Forest Inventory lists 28 species of rare plants for the Big Bear District. Fourteen of these plants are endemic to the Big Bear area occurring nowhere else in the world. Another five species are restricted to the San Bernardino Mountains and other Southern California areas. Another two are rare in California, but with disjunct populations outside the state.

Most of these rare plants grow in areas formerly occupied by a Pleistocene lake. A dense clay deposit in the lakebed was subsequently uplifted and eroded. It's remains are presently distributed along bench lands about Big Bear and Holcomb Valleys. These clay soils inhibit the germination of pine seedlings, allowing these areas to persist since Ice Age times as treeless pockets within the yellow pine forest, dominated by Pinus jeffreyi.

Where these clay soils are paved with saragossa quartzite pebbles, they are called "pavement plains". These natural openings provide the habitat for many Big Bear endemics. The dominant species in "pavement plains" is the caespitose buckweat, Eriogonum kennedyi ssp. austromontanum, commonly associated with Arenaria ursina, Arabis parishii, Castilleja cinerea, Ivesia argyrocoma, and other locally restricted species.

Still other endemics are restricted to clay soils where there is sufficient moisture to create a "vernal wet meadow" situation. In this hahitat, evolution has produced as many as 15 species of rare plants in one such meadow. The rarest endemic of the Big Bear area, the Big Bear Mallow, Sidalcea pedata, and the slightly less endangered Slender-petalled Mustard, Thelypodium stenopetalum, are found in these unique meadows. Both species are virtually on the edge of extinction.

Only three locations in the Big Bear area remain where "pavement plains" and "vernal wet meadows", with their unique floral assemblages, still co-exist. These three critical rare plant areas of Big Bear represent perhaps the highest concentration of rare and endemic species in all of California, possihly the highest in the continental United States, hut their survival is rather dubious. These three locations are:

Eagle Point on Big Bear Lake: A unique combination of open clayey meadows within a yellow pine forest, crossed by annual springs and creeks. There are 15 rare species of plants on this 53 acre parcel, including Sidalcea pedata and Thelypodium stenopetalum. It is under private ownership, surrounded hy housing tracts and the area is now proposed for condominium development! As an added asset, the shoreline and trees on the parcel are used for perching and foraging hy wintering Bald Eagles! Outside Klamath Falls, it is the second largest wintering area of Bald Eagles in California. Last winter the count was 35! The earliest recorded sighting here is 1943. They roost in protected canyons ahove the lake. During the day they perch in the pine trees at Eagle Point where they can spot their prey along the water line. It is not unusual to see as many as 20 at one time.

Baldwin Lake: Only two quarter sections of private land remain un-developed on the north shore of Baldwin Lake. Clay hills crossed hy springs provide the unique habitat for 13 rare plant species, again including Sidalcea pedata and Thelypodium stenopetalum. Thousands of waterhirds on the lake attract the Bald Eagles to perch and forage near the lake shore. A suhdivision is proposed for this area including development of a Wild Animal Park and a cemetery!

Lower Holcomb Valley: On the west edge of this valley, annual springs drain into the wet meadow across clay soils, and some limestone outcrops. There are 14 rare species here, but lacking are the most endangered, Sidalcea pedata and Thelypodium stenopetalum. This valley is mostly under forest service ownership, hut is damaged and abused by ORV's.

Urbanization threatens to consume the last of the Big Bear meadows. Development, particularly of Eagle Point and the north shore of Baldwin Lake, would not only destroy the highest concentrations of endemics in the State, hut would cause the extinction of Sidalcea pedata and Thelypodium stenopetalum.

It is urgent that letters be sent to the U.S. Fish and Wildlife Service recommending emergency listing of Sidalcea pedata and Thelypodium stenopetalum as endangered. Extinction is an immiment possihility for both of these species. Write to:

Sacramento Endangered Species Office
U.S. Fish & Wildlife Service
1230 "N" Street, 14th Floor
Sacramento, California 95814
ATTN: Monty Knudsen

Urge the U.S.F.W.S. to list by emergency rule Sidalcea pedata and Thelypodium stenopetalum as endangered, due to their imminent extirpation and near extinction if developments at Eagle Point and Baldwin Lake proceed. Mention the other significant environmental resources of these two areas - i.e., the other rare plant species all occurring together, the Bald Eagle use of the areas, etc.

Letters are also needed, concerning the significance of Eagle Point and the north shore of Baldwin Lake. Write to:

Environmental Analysis Division
County of San Bernardino
1111 East Mill Street, Building 1
San Bernardino, California 92415

Urge the county planners to consider alternative locations for the wild animal park and cemetery proposals on the north shore of Baldwin Lake, and to deny or declare a temporary moratorium on new developments there pending a resolution of the significant environmental impact of such developments.

Lastly, it is important that the Nature Conservancy know of your concern so that they may proceed as quickly as possible to acquire acreage on the north shore of Baldwin Lake. The Nature Conservancy, supported by SCB, is the leading tax exempt organization that is able to and does acquire such properties to preserve and save them. Their best known acquisition in California is Santa Cruz Island! Write to them at:

The Nature Conservancy
425 Bush Street
Fifth Floor
San Francisco, California 94108
ATTN: Steve McCormick

* * * * *

Note: Mr. Krantz is a biological consultant and has contracted with the Forest Service for work in Southern California with special focus in the Big Bear Lake district. He is a member of SCB.

He is leading Bald Eagle observation walks on Saturdays and Sundays, February 14, 15, 21, and 22, 1981. Meet at 8:00 A.M. sharp at the Ranger Station on the northside of the Lake. Please call him in advance to confirm the walk. (714) 585-8038.

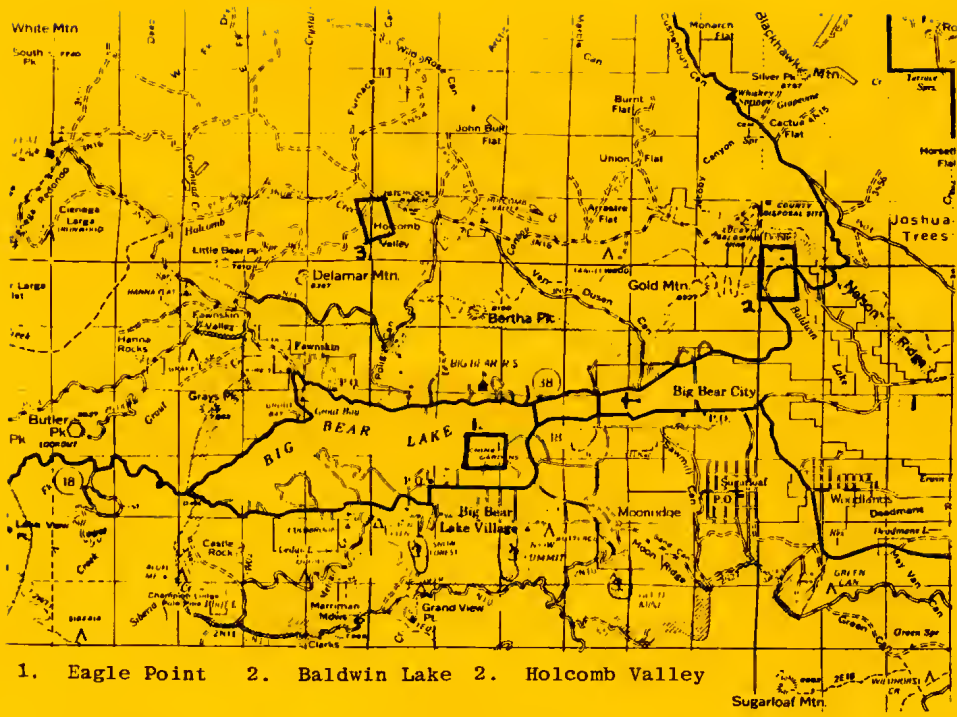
Mr. Krantz is also leading a field trip for SCB on Saturday and Sunday, June 27-28, 1981 to observe the areas and plants described in this article. Meet at 9:00 A.M. in the parking lot in front of the Safeway store on the road between Big Bear and Big Bear City on the south side of the lake.

On page four is Mr. Krantz' chart of the critical rare plant areas of Big Bear Lake and the plants in each area.

On page five is a map of the area.

CRITICAL RARE PLANT AREAS OF BIG BEAR LAKE

Specific Name	Populations: Eagle Point	Baldwin Lake	Lower Holcomb Valley	Rarity
Arabis parishii	X	X	X	Endemic to Big Bear-Holcomb Valley area
Arenaria ursina		X	X	Endemic to Big Bear-Holcomb Valley area
Castilleja cinerea	X	X	X	Endemic to Big Bear-Holcomb Valley area
C. martinii ewanii	X		X	Endemic to the Big Bear area
Echinocereus engelmannii var. munzii		X		Endemic to the mountains of s. Calif.
Eriogonum kennedyi var. austromontanum	X	X	X	Endemic to the Big Bear-Holcomb Valley area
Ivesia argyrocoma	X	X	X	Big Bear area and disjunct in Baja C.
Linanthus killipii		X		Endemic to Big Bear area
Mimulus exiguus	X	X	X	Endemic to Big Bear-Holcomb Valley area
M. purpureus	X		X	Endemic to Big Bear-Holcomb Valley area
Orthocarpus lasiorhynchus	X		X	Endemic to the mts. of s. California
Perideridia parishii	X		X	Endemic to San Bernardino mts.
Phlox dolicantha			X?	Endemic to Big Bear-Holcomb Valley area
Poa atropurpurea	X	X	X	Endemic to Big Bear area and disjunct in Laguna Mts.
Pyrrocoma uniflora ssp. gossypina	X	X	X	Endemic to Big Bear area
Sedum niveum			X	Mts. of s. California & Baja C.
Senecio bernardinus	X		X	Endemic to Big Bear-Holcomb Valley area
Sidalcea pedata	X	X		Endemic to Big Bear area, only 3 populatio
Taraxacum californicum	X	X		Endemic to the San Bernardino mts.
Thelypodium stenopetalum	X	X		Endemic to Big Bear area, only 4 or 5 popu
Astragulus Leucolobus	X	X		Endemic to San Bernardino mts.
Total # Species:	16	14	14	



1. Eagle Point 2. Baldwin Lake 2. Holcomb Valley

FIELD TRIPS

<u>February 28, 1981, Saturday, 9:30 A.M. Fungus Foray, Placerita Canyon Park</u>

Meet at the Nature Center Building. Take Antelope Valley Freeway I-14 to the Newhall area. Freeway exit sign to Park.

Bring trowel or knife, paper bag or basket, wax paper to wrap specimens. We will disperse in groups to collect and then meet around 1:00 P.M. for identification and lunch. Florence Nishida of the L.A. Mycology Society will be our expert. There are fine oak woodlands in the park which should be very productive.

<u>March 14, 1980, Saturday, 9:00 A.M. Mosses in the West Fork, San Gabriel River Canyon</u>

We will walk, or may drive if we secure the Forest Service key, this beautiful canyon that leads to Cogswell Reservoir. The stream and vegetation are magnificent. North facing cliffs should reveal an abundance of bryophytes. This is an unusual trip with unusual leaders, Judy Harpel and David Long, both of whom received advance degrees at Cal. Poly and focused on bryophytes.

Take San Bernardino Freeway (I-10) or Foothill Freeway (I-210) to Azusa Avenue (State 39); north on Azusa Avenue (State 39) whicb becomes San Gabriel Canyon Road. Continue up the canyon past the upper reservoir, bear left and meet at bridge across West Fork of river. <u>A hand lens is essential</u>. Bring lunch and water.

March 21, 22, Saturday and Sunday, Chrystal Springs (Edwards Air Force Base) and Paleo Botanical sites.

Take Antelope Valley Freeway (State 14) to Rosamond to exit. Then east about two blocks to old Sierra Highway and meet at the intersection at 9:30 A.M. Camping Saturday night. Bring the usual, plus binoculars (water birds at the springs should be excellent).

Leaders: Terry Yonkers, Staff Botanist Edwards Air Force Base, and Walt Wright.

March 28, 1981. Native Plant Sale. Rancho Santa Ana Botanic Garden, 1500 North College Avenue, Claremont.

This will be our seventh annual sale of California natives. We have a good stock from the R.S.A. collection plus selections from commercial growers. The gate will open at 8:00 A.M. There is usually a crowd of buyers at the opening and the choice plants go first.

We will also have a wide assortment of botanical books for sale.

We need many SCB volunteers to help. Please be there before 8:00 A.M.

Combine the sale with a visit to the garden - eighty acres of natives with many at peak bloom!

April 4, 1980, Saturday. Starr Ranch, Orange County.

From San Juan Capistrano, go east on the Ortega Highway to Caspers County Park, turn into the Park and continue to Starr Ranch Audubon Preserve. Jeff Froke, audubon manager, and John Little SCB Director, will lead. Meet in Park parking lot.

Eighty percent of the Ranch was burned last year, but many plants are emerging and it should be very interesting.

Some may camp Saturday night at Caspers Park and then botanize other areas on Sunday.

April 10-12, 1981, Orocopia Mountains and Joshua Tree National Monuments.

Chris Davidson and Barry Prigge are planning this trip. Details depend on the extent of desert flowers this year. Call Marvin Chesebro (213) 627-4878 for final details.

April 10-19, 1981, San Ignacio area, Baja California, Mexico.

Eric Hansen (213) 530-7375, evenings) and Walt Wright (714) 990-9092, evenings) will lead this Easter Week trip, hoping to finally visiting some of the cave paintings. Call Eric or Walt for details and reservations.

May 1, 2, 1981. Annual meeting of Southern California Academy of Sciences at Cal. State University, Los Angeles.

May 16, 17, 1981. Little Lake and Red Rock Canyon.

May 22-25, 1981 (Memorial Day weekend). Southern California Palm Society is sponsoring a trip to Guadalupe Island, Baja California. Cost $226.00. Write Al Bredeson, 2347 Peppermint Lane, Lemon Grove, California 92045, $50.00 deposit required.

June , 1981. Big Bear Lake District.

July 11, 12, 1981.. Sequoia National Park

August 21-28, 1981, XIII International Botanical Congress, Sidney, Australia

September 12, 13, 1981. White Mountains.

November 14, 1981. Tour of Huntington Botanical Gardens, San Marino, California.

SOUTHERN CALIFORNIA BOTANISTS
OFFICERS AND DIRECTORS, 1981

President	Marvin M. Chesebro	(213) 627-4878
Vice President	Alan Romspert	(714) 773-3614
Treasurer	Frits Zeylemaker	(213) 441-2673
Secretary	Suzanne Granger	(714) 626-3922
Past President	Chris Davidson	(213) 744-3378

Directors:

Barbara Joe Hoshizaki	1980-1981 term	(213) 663-9141 ext. 282
Robert F. Thorne	1980-1981 term	(714) 626-3922
C. Eugene Jones	1980-1981 term	(714) 773-3548
R. John Little	1980-1981 term	(714) 532-8841
Walt Wright	1981-1982 term	(714) 990-9092
Barry Prigge	1981-1982 term	(714) 626-3922
Curtis Clark	1981-1982 term	(714) 598-4445
Trudy Ericson	1981-1982 term	(714) 532-4085

* * * * * * *

Crossosoma is published bimonthly (February, April, June, August, October and December) by Southern California Botanists, a non-profit association. Dues are on a calendar year basis. Regular $6.00. Students and Retirees $4.00. Groups $10.00.

We thank all those who promptly remitted their 1981 dues. All others please send your checks. This Journal can only be sent to members whose dues are current.

1981 EVENTS

Feb. 14, 15, 21, and 23. Saturdays and Sundays. Bald Eagle observation walks. Big Bear Lake.

February 28, Fungus Foray, Placerita Canyon.

March 4, Bryophytes in West Fork, San Gabriel River Canyon.

March 28, Saturday. SCB Plant Sale

April 4, Saturday. Starr Ranch, Orange County.

April 10-19. Orocopia Mountains or Baja, California

May 1-2. Southern California Academy of Sciences Annual Meeting

---

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

CROSSOSOMA

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont, CA 91711

Crossosoma Vol. 7, No. 2 April, 1981
Editor: M. Chesebro

REPRODUCTION OF COAST LIVE OAK (QUERCUS AGRIFOLIA) IN THE SANTA ANA MOUNTAINS

By Mitch Cruzan

Oak trees (Quercus) are common members of plant communities throughout the United States from the eastern deciduous forests to the savannahs and chaparral of California. Stands of these trees frequently consist only of older trees and although they often produce large numbers of acorns, seedlings rarely survive to become established trees (Korstian 1927, Wood 1938, Griffin 1971 and 1976). In Southern California, Coast Live Oak (Q. agrifolia), for the most part, is no exception (Snow 1973). There are, however, a few isolated stands in the Santa Ana Mountains which seem to contradict this generality.

Blue Jay Campground is located just off the Main Divide Truck Trail about two and a half miles west of El Cariso (Elevation 3400 ft.). It is situated in a basin of low hills surrounded by steep chaparral-covered slopes. Grasslands consisting of both native bunch grasses and introduced annual grasses dominate lower areas, whereas, Q. agrifolia is restricted to upper slopes and hilltops. Where Q. agrifolia does occur it forms dense stands with few undershrubs. Beneath the oak canopy there is little herbaceous growth and the soil is covered with a thick layer of leaf litter often in excess of 8 cm. in depth.

The presence of a large number of both seedlings and saplings at Blue Jay indicated that the oak woodland was actively reproducing. This provided an unusual opportunity to study the reproductive ecology of Quercus agrifolia. In January of 1980, 20 (one square meter) plots were planted with one hundred acorns each and exposed to various treatments. During the same period of time, seedlings were grown in greenhouse flats filled with 8 cm. of vermiculite (9 acorns planted in each of 30, 30 cm. square, flats) at California State University, Fullerton.

Acorns were planted at Blue Jay in full sun and shade. Shaded acorns were covered by screens that provided 32%, 55%, 72% and slightly under 100% shade. Seedlings grown in flats at California State University, Fullerton were given these same shade conditions, but had a constant supply of water and nutrients.

Field seedlings growing in full sun succumbed, probably due to the summer heat or lack of moisture, but, when given 32% or more shade, the majority of seedlings survived. The seedlings grown in greenhouse flats survived well under all shade conditions. The only individuals of these greenhouse seedlings which showed any deleterious effects were those not receiving any direct sunlight. These appeared to be slightly etiolated, as did seedlings under similar shade conditions in the field.

It would appear from the above results that moisture or heat becomes limiting for seedlings in the open during the summer months. The lack of moisture would be intensified when seedlings are competing. To test this hypothesis, one half of each field plot was cleared of grass and herbs and the other half was left undisturbed. Seedlings in full sun and in competition with the annual grass Festuca megalura (the dominant grass in the area) died earlier in the summer than seedlings grown without grass. With 32% shade, less than 50% of the seedlings competing with Festuca survived. On the cleared half of this same plot, seedling survival was greater than 90%. Under 55% shade, more than 90% of the seedlings on cleared and uncleared portions of the plot survived. More heavily shaded plots had results similar to this.

The growth of Festuca was significantly reduced only on heavily shaded plots. Under 72% shade there appeared to be a slight reduction in Festuca biomass, while in complete shade none of the Festuca survived.

For a number of Quercus species, leaf litter plays a major role in the survival of both acorns and seedlings (Korstian 1927, and Barrett 1931). This also appears to be true of Q. agrifolia. When acorns were placed on the soil surface on a one-half meter square area that had been cleared of all grass and leaves, all seeds were removed by animals. In an adjacent, cleared, one-half meter square area, acorns germinated well when planted 5 cm. beneath the soil surface. However, the resulting seedlings were defoliated repeatedly, apparently by rodents. When plots similar to those described above were covered with 2 cm. of oak leaves, very few acorns were removed and herbivory was minor.

A thin layer of oak leaf litter may also aid seedling establishment by inhibiting Festuca and thus lessening competition. Oak leaf litter was placed at depths of 2, 4, 6 or 8 cm. on one meter square plots in an open area dominated by Festuca. Festuca cover dropped from 77% with no litter to 18% with only 2 cm. of leaf litter and to less than 5% with 4 cm. of leaf litter. Grass was completely absent on plots having 6 and 8 cm. of litter.

Whereas a thin layer of oak leaves appears to be beneficial, a very thick layer can be detrimental to germination and seedling establishment. Acorns placed on top of 2 cm. of leaf litter and then covered by 2 cm. of additional leaf litter, had very poor germination. On two other plots where acorns were placed on top of either 4 or 6 cm. of leaf litter and covered by 2 cm. of additional leaf litter, no seedlings established. The critical factor here may be moisture availability since acorns of Q. agrifolia need to imbibe moisture before they can germinate (Snow 1973). Acorns falling into thick leaf litter would have a poor chance of surviving unless they came into contact with a moist substance. Also seedlings grown under thick leaf litter conditions appear to be susceptible to damage by rodents. When seedlings were grown in thick leaf litter (8 cm. to 11 cm. thick) many were destroyed by rodents burrowing beneath the litter and chewing off the portion of the stem just below the cotyledons. Similar instances were reported by Barrett (1933).

At other locations it has been found that without exclosures animals destroy nearly all seedlings of several species of Quercus (including Q. agrifolia) within their first year of growth (Wood 1938, Griffin 1971 and 1976, and Snow 1973). The absence of young trees in these stands indicates that this condition has existed for a considerable period of time. Griffin (1971) found that seedlings of Q. lobata in upper Carmel Valley survived only when both gophers and deer were excluded. Although both of these animals are present at Blue Jay and their activities are often evident within close proximity to the experimental plots, their impact on seedling survival has been very slight. Other small rodents and insects (mostly Lepidoptera larvae) have had a much greater effect on seedling growth but this damage is mostly limited to leaves which have not yet fully sclerified. Seedlings will quickly resprout after most or all of their leaves have been removed; only in a few cases has persistent herbivory resulted in their demise.

Animals can also be highly beneficial to oak reproduction. Burial of acorns by cache-making animals such as the California Ground Squirrel or the Scrub Jay greatly enhances their germination success (Korstian 1927 and Snow 1973). Very often these seeds are not retrieved and the resulting clumps of seedlings mark the location of forgotten caches.

Animal activities seem to have been the most important factor affecting oak reproduction at other locations, whereas, physical factors seem to be more important at Blue Jay. The data presented above suggest that optimal conditions for seedling establishment consist of moderate shade and a thin layer of leaf litter (about 2 cm. deep). Light and leaf litter depth were measured in the oak woodland to determine where these optimal conditions naturally occurred. Leaf litter depths in the woodland (under continuous canopies) averaged close to 11 cm. and light was equivalent to about 10% of full sunlight. Near the edge of the canopy, coverage by Festuca drops off quickly with a corresponding increase in coverage by oak leaf litter. In a 2 meter strip at the canopy edge, leaf litter depth varied from 1 cm. to 4 cm. and coverage by Festuca averaged less than 10%. Because of its position relative to the overstory trees, this strip is shaded for a portion of the day but in most cases also receives some full sunlight. These light conditions combined with the thin layer of oak leaves present in this area should create an environment conducive to the establishment of young oak trees. Field observations support this hypothesis. Healthy looking saplings are most often located at the edge of the oak canopy whereas saplings found within the woodland are often spindly and stunted. This pattern of reproduction should facilitate the development of a continuous-canopied oak woodland and may lead to a slow expansion of these woodlands.

References

Barrett, L. I. 1931. Influence of forest litter on the germination and early survival of Chestnut Oak, Quercus montana, Willd. Ecology, 12:476-484.

Griffin, J. R. 1971. Oak Regeneration in the upper Carmel Valley, California. Ecology, 52:862-868.

_____. 1976. Regeneration in Quercus lobata savannahs, Santa Lucia Mountains, California. Ecology, 95:423-435.

Korstian, C. F. 1927. Factors controlling germination and early survival in oaks. Yale University School of Forestry Bulletin 19. 115p.

Snow, G. E. 1973. Some factors controlling the establishment and distribution of Quercus agrifolia Nee and Quercus engelmannii Greene in certain southern California oak woodlands. Doctoral Thesis, Oregon State University. 105p.

Wood, O. M. 1938. Seedling reproduction of oak in southern New Jersey. Ecology, 19:276-293.

* * * *

Note: The author is a senior at California State University, Fullerton and will receive a B.A. in biology in June of 1981. He plans to attend graduate school at the University of California at Berkeley or the University of Arizona where his concentration will be in pollination ecology. He has been a member of SCB for three years.

* * * *

SOME OAK SPECIES OF SOUTHERN CALIFORNIA

(Nomenclature and illustrations of Abrams, L. 1940. Illustrated Flora of the Pacific States.)

Quercus agrifolia. Encina or California Live Oak

Quercus douglasii. Blue Oak

Quercus wislizenii. Sierra Live Oak

Quercus lobata. Roble or California White Oak

Quercus dumosa. California Scrub Oak

Quercus kelloggii. Kellogg's or Calif. Black Oak

Quercus tomentella.
Island Oak

Quercus macdonaldi.
MacDonald's Oak

Quercus engelmanni.
Englemann's Oak

Quercus chrysolepis.
Canon or Maul Oak

Quercus alvordiana.
Alvord's Oak

Quercus palmeri.
Palmer's Oak

BALDWIN LAKE PROPERTY AT BIG BEAR

The February 1981 issue of Crossosoma dealt at length with the endemics in the Big Bear Lake district, including Baldwin Lake, and the imminent threats to them from developments. We are very pleased to announce that one area is being spared. The Nature Conservancy is purchasing the Baldwin Lake property we described! Donations are needed to assist in paying off the debt of $150,000.00 incurred in the purchase. Please send contributions (tax deductible) earmarked for the Baldwin Lake Project to:

The Nature Conservancy
Southern California Chapter
Post Office Box 921
South Pasadena, California91030

* * * * *

FIELD TRIPS AND EVENTS

April 4, 1981, Saturday. Starr Ranch, Orange County.

From San Juan Capistrano, go east on the Ortega Highway to Caspers County Park, turn into the Park and continue to Starr Ranch Audubon Preserve. Jeff Froke, Audubon manager, and John Little, SCB Director, will lead. Meet in parking lot at 8:30 A.M.

Eighty percent of the Ranch was burned last year, but many plants are emerging and it should be very interesting.

Some may camp Saturday night at Caspers Park or Blue Jay Campground and then botanize other areas on Sunday, including the oak woodland at Blue Jay described in the lead article of this issue.

April 4, 1981, Saturday. Eaton Canyon Park Nature Center.

SCB will sell books at the open house from 9:30 A.M. to 4:00 P.M. We need volunteers to help with the sales. Call Marvin Chesebro (213) 627-4878 to advise if you will be there. The Center is two miles north of the 210 Freeway in Pasadena. Altadena Drive goes to the Center.

April 10-12, 1981. Orcocopia Mountains and Joshua Tree National Monument.

Chris Davidson and Barry Prigge are planning this trip. Details depend on the extent of desert flowers this year. Call Marvin Chesebro (213) 627-4878 for final details.

April 10-19, 1981, San Ignacio area, Baja California, Mexico.

Eric Hansen and Walt Wright will lead this Easter Week trip, hoping to finally visit some of the cave paintings. Call Eric or Walt for details and reservations. Days: both at (714) 641-8829. Evenings: Walt (714) 990-9092 and Eric (213) 530-7375.

May 1-2, 1981, Friday and Saturday. Annual meeting of Southern California Academy of Sciences at Cal. State University, Los Angeles.

May 9 and 10, 1981, Saturday and Sunday. Vernal Pools Symposium.

University of California, Davis, will conduct its "Second Symposium on Vernal Pools and Intermittent Streams" at the Davis Campus. Registration begins at 8:00 A.M., Saturday. Dr. Subadh

K. Jain of U.C.D. is coordinator. Robert F. Thorne is the keynote speaker Saturday evening. Another highlight is a field trip Sunday afternoon to the Jepson Prairie Preserve.

May 16-17, 1981, Saturday and Sunday. Victorville.

Dr. Curtis Clark, one of our Directors, will lead to one of the desert mountains ranges which has flowers in bloom. We also will look for areas of hybridization of desert perennials. All roads will be passable by regular autos.

Meet at 9:30 A.M. in the parking lot of the multi-story Holiday Inn. Fill up with gas before meeting. Take Highway 15 to Palmdale Avenue offramp in Victorville. Left on Palmdale Avenue one block to the Inn.

May 22-25, 1981 (Memorial Day Weekend). Southern California Palm Society is sponsoring a trip to Guadalupe Island, Baja California. Cost $226.00. Write Al Bredeson, 2347 Peppermint Lane, Lemon Grove, California 92045. $50.00 deposit required.

June 27-28, 1981, Saturday and Sunday. Big Bear Lake District

With Tim Krantz (see February Crossosoma).

July 11-12, 1981, Saturday and Sunday, Sequoia National Park.

Leader is Larry Norris, botanist with the Park Service. A volume listing the plants of the Sequoia-Kings Canyon areas is available free by writing to the Ash Meadows Ranger Station, Porterville, California.

August 21-28, 1981, XIII International Botanical Congress, Sidney, Australia

September 12-13, 1981, White Mountains

October 24, 1981, Saturday. Symposium.

California State University, Fullerton. "Biology of Arid Land Plants - Cacti and Succulents."

November 14, 1981. Tour of Huntington Botanical Gardens, San Marino, California.

* * * * *

Crossosoma is published bimonthly (February, April, June, August, October and December) by Southern California Botanists, a non-profit association. Dues are on a calendar year basis. Regular $6.00. Students and Retirees $4.00. Groups $10.00.

We thank all those who promptly remitted their 1981 dues. All others please send your checks. This Journal can only be sent to members whose dues are current.

* * * * *

We are anxious to receive articles for publication in this Journal, particularly articles and notes dealing with botany in Southern California, conservation matters affecting this area and other matters of interest to our readers. Send your proposals to Marvin Chesebro, 510 West Sixth Street, Suite 523, Los Angeles, California 90014. Ten copies are furnished to the authors of published articles.

COMING 1981 EVENTS

April 4, Saturday. Starr Ranch, Orange County.

April 4, Saturday. Eaton Canyon Nature Center.

April 10 - 19. Orocopia Mountains or Baja California.

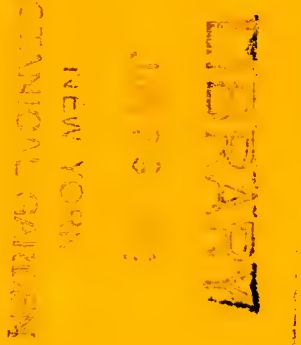
May 1-2, Friday and Saturday. Southern California Academy of Sciences Annual Meeting

May 16-17, Saturday and Sunday. Victorville and desert mountain ranges.

June 27-28, Saturday and Sunday. Big Bear Lake.

(Details on Pages 6 and 7)

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711



CROSSOSOMA

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont, CA 91711

Crossosoma Vol. 7, No. 3 June, 1981
Editor: M. Chesebro

BOTANY AND HISTORY OF THE WHITEWATER MARSH AREA

By Barry Prigge

About 70 miles north of the present Gulf of California, and 36 miles north of the border of Mexico and the United States, lies the Salton Sea, a great sink that was once a part of the Gulf of California.

Over the eons, deposition of sediments that form the Colorado River delta, eventually crossed the Gulf and isolated it's northern portion, which then evaporated to leave the Salton Sink. At times the Sink contained the Lake Cahuilla of Indian legend and now contains the Salton Sea. The Sea is about 33 miles in length and 12 miles in width, extending from Imperial Valley in the south to Coachella Valley in the north. It's surface is about 230 feet below sea level at this time.

Along the northern shore of the Salton Sea and in the delta of the Whitewater River lies the Whitewater Marsh, which is less than 100 acres in area. (Fig. 1)

The vegetation is composed primarily of cosmopolitan wetland species which grow luxuriantly under the favorable conditions of abundant water and a hot climate. Although it is basically a freshwater marsh, the water supporting it is agricultural runoff and contains salts, pesticides, herbicides, and fertilizers that are leached from the cultivated fields. The fertilizers may contribute to the luxurious growth, but the slightly saline conditions limit the diversity of species.

The vegetation of the marsh is dynamic, adjusting to the fluctuations in the level of the Salton Sea, changes in the flow pattern of the Whitewater River in the delta, and the constant deposition of sediments at the mouth of the river. Because of its dynamic nature, the marsh is quite interesting ecologically. Over a short time one can observe ecological succession on the new sediments or on bare strands that open up for recolonization when the sea recedes. One can also observe the demise of salt-sensitive species and the succession of salt-tolerant species in portions of the marsh as the sea rises and inundates areas with salt water.

Whitewater Marsh has a relatively recent history, and its establishment was dependent on the agricultural development of the Coachella Valley, the formation of the Salton Sea, and the stabilization of the Whitewater River. The following is a brief history of the area to establish the time of formation of the marsh and to present factors that have had a significant effect on the marsh.

General History of the Area

Of the early surveys and reconnaissances through the Colorado Desert, the Pacific railroad survey along the 32nd parallel (Blake, 1957) was the only one to explore the area around what is now the Whitewater Marsh. This survey travelled along the northeastern rim of the Salton Sink from Indian Wells, east of Indio, passing below Travertine Point and down to San Felipe Creek, and then down into the bottom of the sink. No marsh along the Whitewater River course was reported. Certainly, if there was a freshwater marsh, the survey would have found it or, at least, have been told about it by the Cahuilla Indians. The only marshes reported by Blake were the salt marshes in the bottom of the sink which were also reported by the other early surveys that passed through the sourthern Colorado Desert.

These marshes received water from the Colorado River and the Whitewater River. The Whitewater river carried storm runoff into the sink about six times from 1862 to the time of formation of the Salton Sea (Nordland, 1978). However, this flow never lasted more than a few days, and normally the river flowed only to Windy Point, North of Palm Springs, where it fanned out and was absorbed into the desert sand. Most of the water came from flood waters that overflowed the banks of the Colorado River and flowed into the sink to form two small saline lakes which would often dry up to leave bare salt flats. According to accounts of early settlers, waters came into the sink about 19 times from 1840 to 1903 (Cory, 1913). From then on irrigation runoff from the irrigation system for the Imperial Valley fed into these saline lakes. This irrigation system was constructed by the California Development Company by clearing and connecting various channels which formed the natural waterways of the Colorado River delta (Kennan, 1917).

This type of flooding was not the same that sometimes flooded the Salton Sink to form ancient Lake Cahuilla. This occurred when the Colorado River changed course and flowed into the sink instead of the Gulf of California. The frequency that the river changed course is reported to be about once every 400-500 yrs (Kennan, 1917), and the last filling was about 300 yrs ago (Norris, 1977).

Farming was established in the Coachella Valley shortly after 1894 when an artesian well was sunk by the Southern Pacific Railroad at Walters (now Mecca) and tapped into an aquifer fed by the Whitewater River and its tributaries (Nordland, 1978). The U.S. Government also drilled a well at Martinez for the Cahuilla Indians at about the same time. Flow from these wells was so abundant that more artesian wells were soon bored for irrigation (James, 1907). For the first time runoff, either directly from the artesian wells or indirectly from irrigation, probably provided enough freshwater year round for the establishment of a marsh. Prior to irrigation the only water that reached the surface was seepage from the perched water table which became too alkaline for freshwater marsh plants as the water passed through the upper saline surface layers. No definite reports were found of a marsh prior to the formation of the Salton Sea, and the runoff may have flowed toward the bottom of the sink where it accumulated salts on the way and became too salty to support anything but pickleweed and saltgrass. If a marsh was established there, it was soon inundated by the Salton Sea.

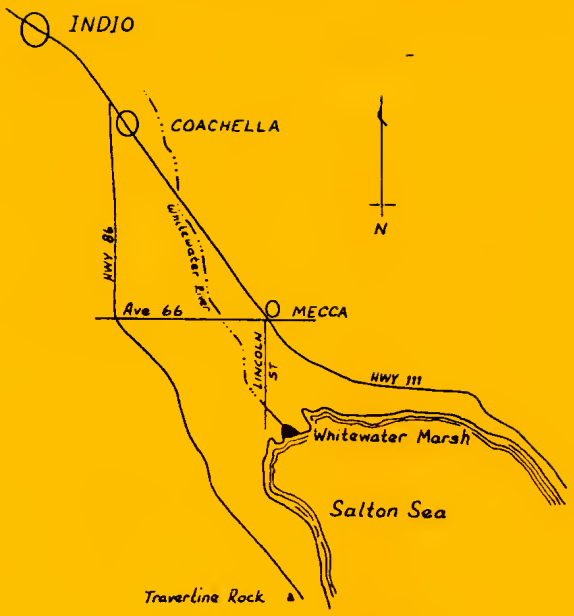


Fig. 1. Map of Coachella Valley.

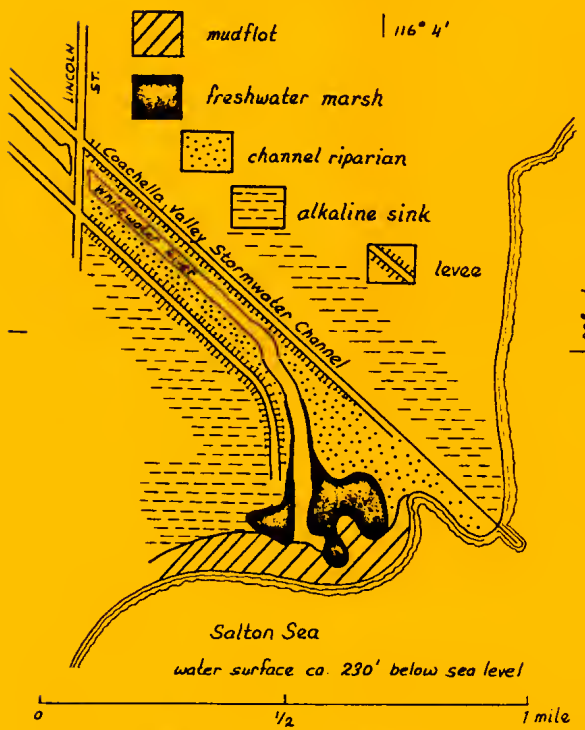


Fig. 2. Map of the plant communities of the Whitewater Marsh area.

The formation of the sea was the result of flood waters of the Colorado River breaching an intake for the main irrigation canal to the Imperial Valley in 1905. This resulted in an uncontrolled flow from the river which poured through the canals across the delta and into the New and Alamo Rivers, flooding the Salton Sink to form the sea. By August, 1905 the total flow of the river was rushing through a now enlarged intake channel, and it was not until 1907 that engineers of the Southern Pacific Railroad and the California Development Company were able to control the river and return it to its former channel (Cory, 1913).

The rate of flow of the river during this period was so great that some suggest that the river would have naturally changed course and flowed into the sink even if the irrigation channels and diversion intake were not there (Kennan, 1917; Sykes, 1914; Cory 1913). By the time the river was returned to its original channel, the surface of the sea was 198ft below sea level. By 1925 the sea receded to almost -250 ft (Norris, 1977) because evaporation, which occurs in this area at a rate of 5 to 6 ft per year (Blake, 1917; Nordland, 1978), exceeded input.

As the sea receded, MacDougal (1914) studied the re-establishment of vegetation along the shores of the Salton Sea from 1907 to 1913. One of his study sites was at Mecca Beach which included part of the Whitewater River delta. On wet areas of this site he reported cat-tails, tules, willows, and cottonwoods, and in the same area Parish (1914) reported mesophytic islets occupied mostly by cat-tails. Both reports are indicative of a freshwater marsh, and, perhaps, this was the beginning of Whitewater Marsh. However, the sea was receding rapidly, and in this area with a slope of 1 to 400, it was receding by over 1 yd per day, too rapid for a well defined marsh to develop (MacDougal, 1914).

Following the completion of the All-American Canal in the late 1930's and the Coachella Canal in 1948, more irrigation water from the Colorado River became available which resulted in more runoff into the Salton Sea. While this brought about the inundation of revegetated areas, including the marsh, the output from the Whitewater River continued to supply freshwater for the establishment of the marsh further up to the slope of the delta. The level of the sea is more or less stabilized at -235 ft. This level is determined by the surface area of the sea, evaporation rate, and the water input which is dependent on rainfall and the amount of water California can withdraw from the Colorado River. Because of the unusually heavy rainfall of recent years, the current level of the sea is about -230 fet, but it should recede back to the equilibrium level of -235 ft.

Channelization has virtually stabilized the course of the Whitewater River except for the delta where the levees flair out and permit the river to braid out. For how long the river has been channelized is not entirely clear. Channelization was started in 1915, but any levees completed were destroyed by the 1916 flood. Work continued slowly because of difficulties in securing right of ways through Indian land, but by 1931 maps dated in that year already show the river as being channelized, at least it is labeled as a storm channel. In 1960 the U.S. Corps of Engineers and the Bureau of Reclamation rebuilt the canal, and it is now channelized from Point Happy to the sea and forms the Coachella Valley Stormwater Channel (Nordland, 1978). Where the river meets the sea the rate of flow decreases and sediments are deposited which form a mudflat. This eventually forms a partial barrier between freshwater and sea water and is probably very important to the success of the marsh. The Coachella Valley County Water District (CVCWD) prevents the mudflat from completely damming the mouth of the channel by dredging new channels through the delta. Thus when the river changes course to the newly dredged channel, the marsh is left high and dry and a new marsh will eventually develop around the mouth of the new course.

Areas adjacent to the marsh probably were farmed at one time as evidenced by the common occurrence of salt-cedars, athel and the paucity of honey or screw-bean mesquite, but most of the lowland areas are now too saline for cultivation. MacDougal (1914) referred to the reclaimation of the flooded areas near the Mecca Beach site which may have been the areas alongside the channel, but an exact location is not given.

Botany

The following botanical discussion includes the marsh and the area in and alongside the Coachella Valley Stormwater Channel from the sea to Lincoln Street as mapped in Fig. 2. In this area the vegetation can be divided into several plant communities, and for this discussion, six communities are recognized: mudflat, freshwater marsh, channel riparian, channel aquatic, levee, and alkaline sink communities.

Changes in the flow pattern of the river can have drastic effects on the wetland communities, as can changes in the level of the Salton Sea on the communities marginal to it. Therefore, the location of these communities would be expected to change through time.

Surveys of this area were done in the winter of 1980-1981; hence, there are many species that could be added to the plant community lists, especially the channel riparian community where annuals could be found in the spring. Species preceeded by an asterisk in the species lists are introduced.

Mudflat Community

The mudflats are on the seaward side of the marsh and are partially inundated. In this area there is rapid deposition of sediments. Exposed regions are vegetated primarily by salt-cedar seedlings and clumps of Mexican sprangle-top. A few scattered clumps of tules and cat-tails also occur on these flats. This area has been inundated recently by saline water as evidenced by the numerous dead salt-cedars and the barnacle shells on their stems. Currently it is in a state of transition to either a freshwater marsh if freshwater continues to be available or to channel riparian if the water is lowered. Species found in this community are:

*Eclipta alba L.	
Leptochloa uninervia (Presl.) Hitchc. & Chase	Mexican sprangle top.
*Polygonum lapathifolium L.	Pale persicaria, willow-weed
*Polypogon monspeliensis (L.) Desf.	beardgrass
*Rumex crispus L.	curly dock
Rumex violascens Rech. f.	Sonora dock
Scirpus americanus Pers.	bulrush, tule
Scirpus paludosus A. Nels.	bulrush, tule
Sesuvium verrucosum Raf.	sea-purslane
*Tamarix ramosissima Ledeb.	salt-cedar
Typha domingensis Pers.	cat-tail

Freshwater Marsh Community

The freshwater community (Munz & Keck, 1949; Thorne, 1975, in press) is dominated by cat-tails which form dense stands in areas that are either shallowly submerged or in which the soil is saturated with fresh or slightly brackish water. Tules, willow, willow-weed, Sonora dock, and common reed are typically along the margins of the cat-tail stands or in clumps by themselves and usually in water. The tules and cat-tails appear to be mutually exclusive. Common species are:

*Cynodon dactylon (L.) Pers.	Bermuda grass
Leptochloa uninervia (Presl.) Hitch. & Chase	Mexican sprangle top
Paspalum distichum L.	knotgrass
Phragmites australis (Cav.) Trinius ex Steudel.	common reed
Pluchea sericea (Nutt.) Cov.	arrowweed
*Polygonum lapathifolium L.	pale persicaria, willow-weed
Salix gooddingii Ball.	black willow
Salix lasiandra Benth.	willow
Scripus americanus Pers.	tule, bulrush
Scripus paludosus A. Nels.	tule, bulrush
Typha domingensis Pers.	cat-tail

Channel Riparian Community

This community is the most heterogeneous of the area and has the greatest species diversity. Included in this community are the high ground areas between the levees. Soils range from sandy to silty clay loams. Some of this area that lies along the channel is frequently cleared of vegetation and is soon vegetated by Russian-thistle, desert dicoria, salt-cedar, etc. Former stream bottoms are densely covered with salt-cedar, amongst which are found scattered plants of pickleweed, lenscale, cottonwood seedlings, willows, mule-fat, cockle-bur, arrow-week, etc. Common species are:

Allenrolfea occidentalis (Wats.) Kuntze	pickleweed
Ambrosia acanthicarpa Hook.	annual burweed, sandbur
Atriplex lentiformis (Torr.) Wats. ssp. lentiformis	lenscale, quailbush
Baccharis glutinosa Pers.	mule-fat
Croton californicus Muell. -Arg.	croton
Cryptantha angustifolia (Torr.) Greene	narrow-leafed popcorn flower
Cyperus odoratus L.	
Datura meteloides A. DC.	jimson weed
Dicoria canescens T. & G. ssp canescens	desert dicoria
Distichlis spicata (L.) Greene ssp. stricta (Torr.) Thorne	salt grass
Helianthus annuus L. ssp. lenticularis (Dougl.) Ckll.	common sunflower
Heliotropium curassavicum (Nutt.) Gray ssp. oculatum (Heller) Thorne.	wild heliotrope
Leptochloa uninervia (Presl.) Hitchc. & Chase	Mexican sprangle top
*Melilotus albus Desr.	
Palafoxia arida B. L. Turner var arida	Spanish needles
Pluchea sericea (Nutt.) Cov.	arrowweed
Populus fremontii Wats. var macdougalii Jeps.	cottonwood
Salix gooddingii Ball.	black willow
Salix lasiandra Benth.	
*Salsola iberica Sennen. & Pau.	Russian-thistle
*Salsola paulsenii Litv.	Russian-thistle
Sesbania exaltata (Raf.) Cory	Colorado River hemp
Sesuvium verrucosum Raf.	sea-puslane
Xanthium strumarium L. var. canadense (Mill.) T. & G.	cockle-bur

Channel Aquatic Community

The channel aquatic community is composed of submersed or floating plants. It is poorly developed because of the lack of slow or still water, and because the stream is laden with pesticides, salts, and sediments which probably inhibit the growth of many aquatics. Those aquatics that have been observed are:

Ceratophyllum demersum L.	hornwort
*Eichhornia crassipes (Mart.) Solms	water-hyacinth
Myriophyllum exalbescens Fern.	water milfoil
*Nasturtium officianale L.	water cress
*Polygonum lapathifolium L.	pale persicaria, willow-weed
Potamogeton pectinatus L.	sago pondweed
Rumex violascens Rech. f.	Sonora dock

Levees

The vegetation of the levees is dominated by seepweed and lenscale, similar to some areas of the higher alluvial slopes that occur in the Salton Sink. The levees have good drainage and provide a habitat for the less salt tolerant plants and those that do not require a high water table. Species that occur in this habitat are:

Atriplex lentiformis (Torr.) Wats. ssp. lentiformis	lenscale, quailbush
Atriplex canescens (Pursh) Nutt. ssp. canescens	four-winged saltbush
*Brassica tournefourtii Gourn.	
Croton californicus Muell. -Arg.	croton
Cryptantha angustifolia (Torr.) Greene	narrow-leafed popcorn flower
Dicoria canescens T. & G. ssp. canescens	desert dicoria
Euphorbia polycarpa Benth. var. hirtella Boiss.	
Palafoxia arida B.L. Turner var. arida	Spanish needles
*Schismus barbatus (L.) Thell.	
Suaeda torreyana Wats. var. ramosissima (Standl.) Munz	seepweed, inkweed

Alkaline Sink Community

The alkaline sink community (Thorne, 1976, in press; Munz and Keck, 1949; MacHargue, 1973) occupies the area along the channel outside the levees. This area may once have been cultivated but is now dominated by pickleweed and seepweed. Salt-cedars are scattered throughout the community, and large athel trees are frequent in the area dominated by seepweed. Salt grass, Bermuda grass, and some saltbush are also present. Soils of this community are very heavy and moist with water being brought to the surface by capillary action. No annuals occur in this community because of the extremely high salinity of the soil surface which is over 2.5% salt by dry soil weight. The pickleweed occurs on the moister, lower sites of the community and has been referred to as the pickleweed association by Shantz and Piemeisel (1924). This association is very saline, and Shantz and Piemeisel reported the average salinity of the top 4 ft. of soil at 1.5% by dry weight of soil. The higher, and drier areas of the alkaline sink community are dominated by seepweed which Shantz and Piemeisel have

referred to it as seepweed association. Here the soil salinity is slightly less than the pickleweed association and averages about 1% for the top 4 ft. of soil (Shantz and Piemeisel, 1924). Lower areas of the alkaline sink community are currently flooded and are in a state of transition.

Species composition is:

Allenrolfea occidentalis (Wats.) Kuntze	pickleweed
Atriplex canescens (Pursh) Nutt. ssp. canescens	four-winged saltbush
Atriplex lentiformis (Torr.) Wats. ssp. lentiformis	lenscale, quailbush
*Cynodon dactylon (L.) Pers.	Bermuda grass
Distichlis spicata (L.) Greene ssp. stricta (Torr.) Thorne	salt grass
*Tamarix aphylla (L.) Karsten	athel, tamarisk
*Tamarix ramosissima Ledeb.	salt-cedar
Suaeda torreyana Wats. var. ramosissima (Standl.) Munz	seepweed, inkweed

* Naturalized species

Literature Cited

Blake, W. P. 1857. Geological Report. Pacific Railroad Reports, Vol. V. U. S. War Dept., Washington, D. C.

Blake, W. P. 1914. The Cahuilla Basin and the Desert of the Colorado, pp. 1-12. In D. T. MacDougal (Ed.), The Salton Sea. Carnegie Inst. Publ. No. 193. Washington, D. C.

Cory, H. T. 1913. Irrigation and river control in the Colorado River delta. Trans. Am. Soc. Civil. Eng. 76:1204-1571.

James, G. W. 1907. The Wonders of the Colorado Desert, 2 Vols. Little, Brown and Co., Boston.

Kennan, G. 1917. The Salton Sea. MacMillan Co., N. Y.

MacDougal, D. T. 1914. Movements of vegetation due to submersion and dessication of land areas in the Salton Sink, pp. 115-171. In D. T. MacDougal (Ed.), The Salton Sea. Carnegie Inst. Publ. No. 193. Washington, D. C.

McHargue, L. T. 1973. A vegetational analysis of the Coachella Valley, California. Ph.D. dissertation, Univ. Calif., Irvine.

Munz, P. A., and Keck, D. D. 1949. California plant communities. Aliso 2:87-105.

Nordland, O. J. 1978. Coachella Valley's Golden Years. Rev. Ed. Coachella Valley County Water District. Desert Printing Co., Inc., Indio, CA.

Parish, S. B. 1914. Plant ecology and floristics of Salton Sink, pp. 85-114. In D. T. MacDougal (Ed.), The Salton Sea. Carnegie Inst. Publ. No. 193. Washington, D. C.

Shantz, H. L., and Piemeisel, R. L. 1924. Indicator significance of the natural vegetation of the southwestern region. J. Agric. Res. 28:721-801.

Sykes, G. 1914. Geographical features of the Cahuilla Basin, pp. 13-20. In D. T. MacDougal (Ed.), The Salton Sea. Carnegie Inst. Publ. No. 193. Washington, D. C.

Thorne, R. F. 1976. The vascular plant communities of California, pp. 1-31. In J. Latting (Ed.), Plant Communities of southern California. Calif. Nat. Plt. Soc., Spec. Publ. No. 2.

Thorne, R. F. In press. The desert and other transmontane plant communities of southern California.

Note: Barry Prigge is a doctoral candidate in botany at Claremont College and does extensive work at Rancho Santa Ana Botanic Garden with Dr. Robert F. Thorne,

* * * * *

Leptochloa uninervia. Mexican sprangle top

Typha angustifolia. cat-tail

Dicoria canescens. desert dicoria

Rumex violascens. Sonora dock

Suaeda Torreyana. seepweed, inkweed

Allenrolfea occidentalis. pickleweed

(Nomenclature and illustrations of Abrams, L. 1940. Illustrated Flora of the Pacific States.)

WHY DO SCIENTIFIC NAMES HAVE THOSE CURIOUS ABBREVIATIONS AFTER THEM?

by Curtis Clark

New species are made known to the scientific community by a process known as "valid publication". A new species is validly published when it is described in a book or journal with wide circulation among botanists. The description must be in Latin (the "universal language" among botanists) and it must cite a "type specimen" (an individual plant specimen to which the name always refers). When the scientific name of that species is afterwards cited, it is followed by an abbreviation of the name of the person who described it. Thus Avena sativa L., the cultivated oat, was named by the Swedish botanist Carl Linnaeus. Eschscholzia californica Cham. was named by Adelbert Ludwig von Chamisso, the botanist on the Kotzebue expedition. Sometimes a botanist will name a new species, and later another botanist will transfer it to a different genus, or change its rank to subspecies or variety, or in some other way modify the name. In these cases the author of the original name appears in parentheses, followed by the name of the person making the change. Asa Gray (the "father of American botany") named Franseria dumosa Gray; later, Payne transfered it to Ambrosia, resulting in Ambrosia dumosa (Gray) Payne. The value of these abbreviated "author citations" is that they allow us to specify exactly which species we are talking about. Many plant manuals include the author citations, and biographical information about authors of California species can be found in the back of A California Flora by P.A. Munz.

* * * * *

SYMPOSIUM

Southern California Botanists will again co-sponsor a Symposium with California State University, Fullerton's Department of Biological Science. The subject is "Cacti and Succulents" and it will be in honor of Dr. Lyman Benson. It will be at California State University, Fullerton on Saturday October 24, 1981 from 9:00 A.M. to 5:30 P.M.

Dr. Benson will present introductory remarks. The speakers will be Edward F. Anderson of Whitman College, Jerry McLaughlin of Purdue University, Authur C. Gibson of U.C.L.A., Irvin P. Ting, University of California, Riverside, Donald Pinkava, Arizona State University, Tempe, and Reid Moran, Museum of Natural History, San Diego.

David L. Walkington of California State University, Fullerton, is doing the arrangements.

* * * * *

BOTANICAL BOOKS AVAILABLE

S.C.B. maintains a substantial stock of books for sale at a 10% discount to members. We have technical and popular books, including many floras.

Write: S.C.B. Booksales, care of Gardner
777 Silver Spur Road (Suite 111)
Rolling Hills Estates, California 90274

BOTANY PRIZE AT SOUTHERN CALIFORNIA ACADEMY OF SCIENCES

S.C.B. again awarded a $100.00 prize for the best paper presented on botany at the annual meeting on May 1, 1981. Susan Goode was the winner this year with her paper on plants in the La Jolla Canyon.

* * * * *

FIELD TRIPS AND EVENTS

June 27-28, 1981. Saturday and Sunday, Big Bear Lake

Tim Krantz will lead this trip to see the areas and plants described in his article in the February, 1981 issue of Crossosoma. Meet at 9:00 A.M. in the parking lot in front of the Safeway store, on the road between Big Bear and Big Bear City, on the south side of the lake. Camping Saturday night.

July 11-12, 1981. Saturday and Sunday, Sequoia National Park

Larry Norris, a botanist in the Research Office of the National Park Service, will lead. Meet at 9:30 A.M. on July 11, at the Crescent Meadow Picnic Area, Giant Forest in Sequoia National Park. (Mileage - Los Angeles to Giant Forest 225 miles, driving time 4 1/2 hours.) Camping reserved in Group Camp at Dorst Creek Campground for Friday and Saturday nights. Send self addressed envelope to Marvin Chesebro, 510 West Sixth Street, Los Angeles, California 90014 for further details.

This will be a wonderful trip to the Sierras!

August 21-28, 1981, XIII International Botanical Congress, Sidney, Australia

September 12-13, 1981, White Mountains

October 24, 1981, Saturday. Symposium

California State University, Fullerton. "Biology of Arid Land Plants - Cacti and Succulents." 9:00 A.M. to 5:30 P.M.

November 14, 1981. Tour of Huntington Botanical Gardens, San Marino, California.

* * * * *

Crossosoma is published bi-monthly (February, April, June, August, October and December) by Southern California Botanists, a non-profit association. Dues are on a calendar year basis. Regular $6.00. Students and Retirees $4.00. Groups $10.00.

We thank all those who promptly remitted their 1981 dues. All others please send your checks. This Journal can only be sent to members whose dues are current.

COMING 1981 EVENTS

June 27-28, 1981, Saturday and Sunday, Big Bear Lake

July 11-12, 1981, Saturday and Sunday, Sequoia National Park

September 12-13, 1981, White Mountains

October 24, 1981, Saturday, Symposium

(Details on Page 11)

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

CROSSOSOMA

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont, CA 91711

Crossosoma Vol. 7, No. 4 August, 1981
Editor: M. Chesebro

SENSITIVE PLANTS IN THE CLEVELAND NATIONAL FOREST

by Earl W. Lathrop

Drawings by Mark Ford

In keeping with the concern for threatened and endangered plants and animals, the Cleveland National Forest in southern California maintains a Sensitive Plant Species List (USDA/FS, 1980). The plants on this list are considered sensitive for various reasons, but perhaps mostly because of their vulnerability to environmental impacts or stresses.

This paper includes the sensitive plants of the Trabuco and Descanso Districts (exclusive of the Laguna-Moreno Demonstration area) of the Cleveland National Forest, California, as well as species found during extrapolation surveys within a few kilometers of the forest borders. More detailed reports of these surveys are on file at the headquarters of the Cleveland National Forest (CNF) in San Diego. Similar surveys have been done in other districts of the forest; Fred T. Sproul, for example, surveyed the Laguna-Moreno Demonstration area and Ricardo Villasenor the Palomar District.

The Trabuco Ranger District is located in the Santa Ana Mountains, the northernmost extension of the Peninsular Ranges in southern California. Most of the range is divided between Riverside and Orange counties; a small portion in the south is in San Diego county (Lathrop and Thorne, 1978: Fig. 1).

The Descanso Ranger District (exclusive of the Laguna-Moreno Demonstration area) is approximately 54,540 hectares in area and is located in eastern San Diego county roughly west and south of Cuyamaca Rancho State Park (Fig. 1). The gabbro soils, which influence the distribution of many of the sensitive plant species of the Descanso District are described by Oberbauer (1979). The relation of soil diversity to distribution of some of the sensitive species is also elucidated by Kruckeburg (1969).

The rarity of the species is not indicated in the CNF Sensitive Plant Species list. This information, for most but not all of the species, is included in Shevock (1976), Beauchamp (1978) and Powell (1980).

The critical distribution and rarity of the sensitive species are shown in Table 1. Argemone munita Dur. & Hilg. ssp. robusta G. Owneby and Dudley viscida (Wats.) Moran were found only in the Trabuco District. The remaining 7 species are reported for the Descanso District. Three other species, which were on the 1979 CNF list when the surveys were started and subsequently removed, are also found in the area. Haplopappus arborescens (Gray) Hall occurs in both districts. Dicentra chrysantha (H & L) Walp. and Cupressus quadalupensis Wats. ssp. forbesii (Jeps.) Beauchamp ex Thorne were found only in the Trabuco District.

Extrapolation Surveys

The species listed here were not found within at least one of the two district boundaries but could feasibly occur in one or the other because of their reported habitat and nearby location. These are:

Astragalus brauntonii Parish, reported near the Trabuco District in Coal Cyn. on the N. slope of Sierra Peak.

Brodiaea orcuttii (Greene) Baker and Myosurus minimus L. var. apus Greene occur in or about the vernal pools of the Santa Rosa Plateau which borders the Trabuco District in the south.

Satureja chandleri (Bdg.) Druce also occurs on the Santa Rosa Plateau in DeLuz Canyon and near the USFS Tenaja Guard Station.

Calochortus dunni Purdy is found near the Descanso District at Guatay Mtn. and Desert View south of Julian.

Grindelia hallii Steyerm is found in Cuyamaca Rancho State Park which borders the Descanso District.

Limnanthes gracilis Howell var. parishii (Jeps.) C. Mason is found about Cuyamaca Lake but is not likely to occur in the Descanso District because the preferred habitat of wet grassy depressions is not well represented there.

The 9 sensitive plant species and 2 of the extrapolation species (Astragalus brauntonii and Satureja chandleri) are illustrated in Figures 2-12. Due to lack of space, the reader is referred to the author's full file reports of these species, alluded to previously, for more detailed information, especially habitat requirements and management recommendations. However, a few comments should be made about some of the more critical areas where most of the sensitive species occur.

1. Ortega Highway. Dudleya viscida is fairly well protected here by virtue of its habitat-the steep rocky cliffs of San Juan Canyon.

2. King Creek. The good stands of Cupressus stephensonii on this canyon slope are well protected by the personnel of both the Descanso Ranger District and Cuyamaca Rancho State Park.

3. Lyons Peak. Access to this important area, an adjunct to the Descanso District, is controlled by a locked gate. Thus the three sensitive plant species here (Table 1) are afforded some protection.

4. Lawson Peak. This area, while not as scenic as Lyons Peak, is truly a valuable botanical area. Four sensitive species occur here (Table 1) and the spring flora is relatively rich in chaparral and ground cover species. Unfortunately there are no locked gates on the access roads leading to this area. It has been recommended to the Forest Service that access to this area should be controlled, at least during the flowering season of the sensitive species.

5. Moreno Dam. Ribes canthariforme is well protected here by controlled access. Drought periods may be its only threat. Ribes canthariforme, unlike R. indecorum Eastw. which grows in the same areas, is found mostly in rocky ravines or among large boulders where water harvesting is possible, perhaps indicating the need for extra moisture by this species.

6. Viejas Grade, Viejas Mtn. This area is mentioned more for what hasn't been found here recently, namely Acanthomintha ilicifolia. While this annual has been reported from this area in the past, the author was unable to find it in 1980, despite frequent trips there throughout the spring and summer. Since it is an annual, it may have failed to appear simply because of inadequate rainfall. In any case, it is rare.

7. Hagador Canyon, Sanitago Peak. Aside from subspecies of the prickly poppy (Argemone), considered to be endemic to the Trabuco District, these two areas are floristically very rich.

Literature Cited

Beauchamp, R.M., 1978. Recommendations for San Diego and Imperial counties rare plants proposed for the revision of the inventory of rare and endangered vascular plants of California, California Native Plant Society. Unpublished report, San Diego State University, California.

Kruckeburg, A.R., 1969. Soil diversity and the distribution of plants, with examples from Western North America. Madrono 20:129-154.

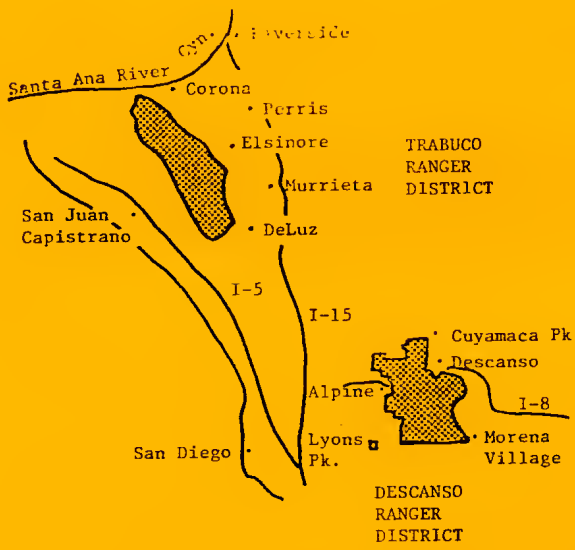
Lathrop, E.W. and R.F. Thorne, 1978. A flora of the Santa Ana Mountains, California. Aliso 9:197-278.

Oberbauer, T.A., 1979. Influence of gabbroic substrate on plant distribution. Lecture at Southern California Botanists symposium on rare plants in southern California. February 3, 1979. Los Angeles County Natural History Museum.

Powell, W.R., 1980. Inventory of rare and endangered vascular plants of California. California Native Plant Society special publication no. 1, second edition.

Shevock, J.R., 1976. Floristic regions of the Santa Ana Mountains with emphasis on the rare, endangered and geographically interesting species. Unpublished report for a seminar in physical geography, California State University, Long Beach, 15 pp.

Note: Dr. Lathrop is a professor in the Department of Biology, Loma Linda University. His research interests are in floristics and plant ecology. He is a member of SCB. Mark Ford is a graduate student in the same department.



* Figure 1. Map of the Trabuco and Descanso Ranger Districts, Cleveland National Forest.

Table 1. Critical areas and rarity status of sensitive plant species. Species marked (*) occur only in the Trabuco District; all others arein the Descanso District.

Species	Location(s)	Rarity Status
Acanthomintha ilicifolia (Gray) Gray	Viejas Grade	seldom reported, endangered in part
Argemone munita Dur. & Hilg. ssp. robusta G. Owenby*	Hagador Canyon Santiago Peak	ssp. endemic to the Trabuco District, reported as rare by Shevock
Brodiaea orcuttii (Greene) Baker	King Creek	rare, of limited distribution, endangered in part
Calamogroastis densa Vasey	Lawson and Lyons peaks King Creek, Los Pinos mountain	confined to several populations, not endangered
Cupressus stephonsonii C. B. Wolf	King Creek	confined to several populations, not endangered
Dudleya viscida (Wats.) Moran*	Ortega Highway .3 km E of USFS San Juan Station	occurrence within the district confined to one population, not endangered, reported as rare by Shevock
Monardella hypoleuca Gray ssp. lanata (Abrams) Munz	Lawson and Lyons peaks (Cuyamaca Park by extrapolation)	confined to several populations, not endangered
Ribes canthariforme Wiggins	Lawson and Lyons peaks Moreno Dam	confined to several populations, not endangered
Senecio ganderi Barkley & Beauchamp	Lawson Peak (Cuyamaca Park by extrapolation)	confined to several populations, not endangered

Senecio ganderi (groundsel)
Figure 2

Cupressus stephensonii
(Cuyamaca cypress)
Figure 3

Dudleya viscida
(live forever)
Figure 4

Monardella
hypoleuca ssp.
lanata
(pennyroyal) Fig. 6

Satureja chandleri
(chandler's savory)
Figure 7

Argemone munita ssp. robusta
(prickly poppy) Figure 5

Ribes cantharifonne
(currant) Figure 8

Acanthomintna
ilicifolia
(thornmint)
Figure 9

Brodiaea orcuttii (blue dick relative) Figure 10

Calamagrostis densa (reedgrass) Figure 11

Astragalus brauntonii (loco weed) Figure 12

VOLUNTEERS FOR SCB

SCB is managed, governed and operated by volunteers, who in addition to their time, contribute such costs as travel, telephone, secretarial, etc., etc. The Directors contribute about four (4) hours per month and travel up to 75 miles for monthly director's meetings. Book sales are time-consuming. Publishing Crossosoma requires about two (2) days of work for each issue, searching for articles, editing, typing, proofing, pasting and work with the printer and the mailer. Field trips require planning, plant lists, etc.

We need help! The present crew must have new support and replacements. For some, it's a labor of love. It really is gratifying work! For others, it's a small compensation for the many benefits received each year from SCB.

So examine your talents and your conscience, and let your President know what you will do. Write an article or note for Crossosoma. Get someone else to do so. Help at book sales. Proof read. Lead a field trip to some place special to you, or suggest one. You name it, and write Marvin M. Chesebro, 510 West 6th Street, Suite 523, Los Angeles, California 90014

* * * * *

Crossosoma is published bi-monthly (February, April, June, August, October and December) by Southern California Botanists, a non-profit association. Dues are on a calendar year basis. Regular $6.00. Students and Retirees $4.00. Groups $10.00.

COMING 1981 EVENTS

September 12-13. White Mountains cancelled (too far). Instead, meet at Chrystal Lake parking lot, Saturday 9:30 a.m. Take 39 north from Azuza. Call Walt Wright (714) 529-4139

October 10. Annual Pot Luck Dinner. Rancho Santa Ana Botanic Garden, 6 p.m.

October 24. Symposium. Cactus and Succulents, California State University Fullerton, 9:30 a.m.

November 14. Tour of Huntington Botanical Gardens. San Marino, California 9:30 a.m.

SOUTHERN CALIFORNIA BOTANISTS

Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont CA. 91711

Crossosoma Vol. 7, No. 5 October, 1981
Editor: M. Chesebro

CROSSOSOMA

PROGRAM

CACTI and SUCCULENTS SYMPOSIUM

Saturday, October 24, 1981
California State University, Fullerton

Welcome to the Eighth Annual Symposium of the Southern California Botanists, consponsored this year by the Department of Biological Science, California State University, Fullerton.

You are invited to a symposium honoring Dr. Lyman Benson, the foremost authority on cacti, and featuring information and results on recent studies of cacti and other succulents. The purpose of this symposium is to present some of the new and innovative research and experimental investigations being done with these plants in cytology, physiology, taxonomy, ecology, and evolution.

Our speakers are eminent in their fields, but have planned their presentations to be of interest to those without specialized knowledge of the subjects. We are sure everyone will find the day most rewarding.

The symposium will convene in the California State University, Fullerton, University Center Multipurpose Rooms A and B on Saturday, October 24, 1981, from 8 a.m. to 6 p.m. General admission is $10. For Southern California Botanists and students, the admission is $5. Pre-registration forms are available from the Office of Extended Education (773-2611).

For those who want to take advantage of the college credit available for this symposium, there will be an additional $20 fee, payable to CSUF through the Office of Extended Education. Instructor is Dr. David L. Walkington, Department of Biological Science, California State University, Fullerton. For further information call Dr. Walkington at 714/773-2611, or write: Dr. David L. Walkington, Office of Extended Education, Rm. S-161, California State University, Fullerton, Fullerton, CA 92634.

The following is a list of the times, titles and abstracts submitted by the speakers. Following each talk, there will be a brief period for questions.

8:00-9:00 - Registration

9:00-9:05 - Introduction and welcome by Dr. David L. Walkington, Department of Biological Science, California State Univeristy, Fullerton.

9:05-9:15 - Introductory remarks by Dr. Lyman Benson, Professor Emeritus, Pomona College.

9:15-10:00 - "THE ECOLOGY AND EVOLUTION OF THE GALAPAGOS ISLAND OPUNTIAS"

Edward F. Anderson, Whitman College

The genus Opuntia (Family Cactaceae) is an important floral element of the arid and transition zones of the Galapagos Islands. These cacti probably reached the archipelago by bird dispersalfrom the South American mainland. However, the two species of Opuntia along the coast of Ecuador are not closely related. Rather, it is hypothesized that the Galapagos opuntias came from one or more populations within the Andes mountains. Pollination of Opuntia in the islands is accomplished by the Galapagos carpenter bee and the cactus ground finch. Fruit production is asynchronous which encourages dispersal by both birds and reptiles. Both sexual and asexual reproduction occur in the island populations; the latter predominates in O. echios var. gigantea. Although occurring primarily in the arid and transition zones, Opuntia populations are also found in three mesic sites. These may be relic populations that have persisted since about 24,000 years ago when the entire archipelago was more arid. Arborescence seems to be due to overtopping and competition. Apparently the ancestral opuntias had the necessary genetic potential for arborescence; thus, natural selection as well as a uniform maritime climate has led to the spectacular tree cacti found in the archipelago today. Spine dimorphism is the result of natural selection for heavy spinesin young plants to aid in moisture collection, protection against intense solar radiation, and protection against herbivores. Arborescent adult plants possess only bristly spines.

10:00-10:15 - Break

10:15-11:00 - "CACTUS ALKALOIOS: CHEMOTAXONOMY"

Jerry McLaughlin, Purdue University

In the past twenty years, the published literature on cactus alkaloids has expanded significantly, yet this work has been ignored by most cactologists. Today we know that certain B-phenethylamines, teterahydroisoquinolines, imidazoles, and (possibly) indoles are distributed, in sometimes logical fashion, throughout the cactus family. For example, the hallucinogen, mescaline, is produced in detectable quantities by certain species in all three of the major cactus tribes. Some cactus species, such as peyote, will elaborate and accumulate a whole series of alkaloids, while other species, such as the platyopuntias, accumulate none at all.

Now that many of the common cactus alkaloids have been identified and can be easily detected, the time seems appropriate for cactologists to study their distribution patterns within traditional cactus taxa. The strong possibility exists that chemotaxonomic patterns will be useful in cactus taxonomy. In this presentation, a review will be made of our work on cactus alkaloid chemistry, and some apparent patterns will be suggested.

11:00-11:45 - "INNOVATIVE STRUCTURAL DESIGNS OF CACTI"

Arthur C. Gibson, University of California, Los Angeles

In the course of evolution, cacti experienced reductions in leaf size and shifted photosynthetic processes to perennial stems. Practically every anatomical and morphological feature has been modified in this conversion; and many structural properties of cacti appear to have great survival benefits, designed to withstand desiccation and overheating while retaining the capacity to produce and recycle energy in an efficient manner. Moreover, in extratropical latitudes, structural adaptations may be designed to minimize freezing of stems in winter.

A typical cactus has the following structural features: areoles, consisting of spines or trichomes or both, produced on an enlarged base or rib; an elastic "skin", composed of an epidermis and an hygroscopic, collenchymatous hypodermis, all this covered by a waxy cuticle; chlorenchymatous outer cortex, composed of large, watery cells with conspicuous intercellular air spaces and often including mucilage structures; an elaborate primary vascular system to facilitate movements of materials to and from other parts of the plant; a solid or dissected cylinder of wood, which often has properties much different than wood of typical desert plants; and a much enlarged and often mucilaginous pith. Taken individually each of these structures can be hypothesized as advantageous for the fundamental needs of a cactus stem. However, when numerous simple adaptations are considered collectively, other adaptive advantages appear, some which have not been widely discussed. As time progresses, the various morphological designs of cacti are being understood in terms of physiological ecology.

Noon-1:30 - Lunch Break. Open house, Arboretum and Greenhouses

1:30-2:15 - "RESPONSES OF CACTI/SUCCULENTS TO WATER STRESS: SHIFTS IN METABOLISM FROM C_3 TO CAM"

Irwin P. Ting, University of California, Riverside

Crassulacean acid metabolism (CAM) is known to occur in 20 plant families. CAM is marked by a massive diurnal fluctuation of malic acid (accumulating at night) and a reciprocal fluctuation of storage carbohydrate. Stomata are open at night and closed during the day, resulting in CO_2 fixation and transpiration at night. Many species such as in the Cactaceae and Crassulaceae appear to be obligate CAM plants, but others such as some species of the Aizoaceae, Portulacaceae, peperomias of the Piperaceae, and Pereskia, but not Pereskiopsis, of the Cactaceae are C_3 except under stress conditions. When these plants are stressed by drought or salinity, there is a metabolic shift from C_3 photosynthesis to CAM although each taxon seems to have a variation on the basic CAM model. CAM is induced in the Aizoaceae and the Portulacaceae. In Peperomia and Pereskia, however, the shift in response to stress is from C_3 to a variation of CAM called idling. In idling, stomata close both day and night, and internally generated CO_2 is recycled through the CAM pathway. Opuntia of the Cactaceae and Yucca of the Agavaceae respond to stress by shifting from CAM to idling. C_3 photosynthesis is never apparent. In the Crassulaceae, stress results in dampening of CAM and the plants evidently do not shift to idling. In Portulacaria afra, the plant hormone abscisic acid, known to close stomata and increase in response to water stress, causes all the attributes of CAM to appear in unstressed plants functioning in C_3 photosynthesis. There is insufficient data to generalize on the kinds of water stress responses of succulents, but some trends are now apparent.

2:15-3:00 - "CACTUS CHROMOSOMES AND HYBRIDIZATION"

Donald Pinkava, Arizona State University, Tempe

Chromosome counts from 526 taxa (433 species in 77 genera) of Cactaceae establish the base number of the family as x = 11. Polyploidy plays a significant role in the evolution of cacti, particularly in Opuntioideae, with 110 of 174 taxa (63.2%) counted being polyploid at levels of 3-8, 10-13, 19-20, and 30x. Correspondingly Pereskioideae, the most primitive subfamily, have no polyploidy in six species counted. Cactoideae have 36 of 346 taxa (10.4%) counted as polyploid at levels of 3-4, 6, 8, and 24x. Polyploidy has been recorded for 19 genera.

Aneuploidy has been reported in the following genera: 2n = 18 (Gymnocalycium, Mammillaria), 20 (Hylocereus), 24 (Oeamia, Echinocereus, Epiphyllum, Mammillaria, Pereskia, Zygocactus), and 38 (Ariocarpus, Notocactus). Of these, all identified taxa have been counted since as also diploid except for two: Deamia testudo (Karw.) Br. & R. and Notocactus apricus (Arech.) Berger. All aneuploid counts were made prior to 1940 except for one (Oeamia). One trisomic (2n = 67) has been reported for Opuntia phaeacantha Engelm.; one inversion, in Opuntia curvospina Griffiths.

Non-disjunction has been found in Echinocereus (one sp.), Mammillaria (one sp.) and Opuntia (two spp.). Different ploidy levels have been reported from root tips of the same individual as diploid and triploid in Mammillaria (three spp.) and Neolloydia (one sp.) and as tetra-, penta-, and heptaploid in Opuntia (one sp.).

Chromosome numbers prove promising in understanding certain hybridization studies such as: 1) odd-number euploid hybrids from even-number euploid parents at levels of 7x (interspecific), 5x (inter- and intraspecific) and 3x (intergeneric and interspecific); 2) even-number euploid hybrids from even-number euploid parents (4x from 6x and 2x species); and 3) triploids from diploid parents (inter- and intraspecific). At least six taxa are known only at 2x and 3x levels; one-sided doubling (union of reduced and unreduced gametes) has been suggested as a mechanism.

3:00-3:15 - Break

3:15-4:00 - "THE STONECROP FAMILY: VARIATIONS ON A PATTERN"

Reid Moran, Museum of Natural History, San Diego

The stonecrops (crassulaceae) are a family of succulent plants with some 1500 members, best represented in the Mediterranean region, southern Africa, eastern Asia, and Mexico. This presentation will not be a great contribution to science but simply a pictorial survey to show something of the great variation, and the beauty, within the family. Predictably, the variation is not random but systematic, centered on a basic family pattern. Beyond that, it is hard to abstract 150 slides.

4:00-4:15 - Summary -- David L. Walkington

4:30-5:30 - Reception, University Center Patio. Hosted by the CSUF Department of Biological Science.

* * * * *

* * * * *

THE NATURE CONSERVANCY

This year is the thirtieth anniversary of The Nature Conservancy! In those years it has grown from a collection of a few dedicated ecologists, with no financial resources, to a private, non-profit, national conservation organization with over 100,000 members that has achieved the preservation of over 1.6 million acres of islands, marshes, forests, streams, lakes, beaches and prairie lands across America. Being totally independent and resourceful, it is able to move quickly and effectively to secure threatened areas. It was the organization accepted by the owner of Santa Cruz Island to acquire the 54,500 acres there! Since the acquisition of the first preserve in 1954, 2743 projects have been completed!

Over 70,000 acres of biologically diverse areas in California have been acquired, including Big Creek (4,000 acres), Santa Rosa Bighorn Sheep Preserve (7,700 acres) the Desert Tortoise Preserve (1,200 acres). Jepson Prairie and Vernal Pools (1,500 acres), 1500 acres of Riparian Forest at the South Fork of the Kern Preserve, 3,200 acres of freshwater marsh at the Creighton Ranch near Corcoran, and most recently 160 acres at Baldwin Lake.(See Crossosoma, February, 1981)

In January 1979, The Conservancy agreed to "design and develop a data management system" for the Significant Natural Areas Program in California - as it has done successfully in 20 states in the past five years. The Conservancy will work with State personnel, the California Native Plant Society, The California Natural Areas Coordinating Council, The University of California and other conservation groups to establish a continually updated and expanding data bank and information inventory of all the state's plant and animal species and ecosystmes. This work is progressing well and will be an invaluable asset to California.

SCB contributed to the acquisition of Santa Cruz Island in 1980 and Baldwin Lake and Jepson Prairie in 1981. Our modest donations provide dollars, and demonstrate the wide support the Conservancy needs in its programs.

Dues range from $10.00 for subscribing members, to $1,000.00 for life members and corporate members. All members receive bi-monthly the excellent News magazine, with many full color photos and state-by-state reports on new projects. For a membership or information write The Nature Conservancy, 1800 North Kent Street, Arlington, Virginia 22209.

* * * * *

* * * * *

STUDENTS RESEARCH GRANTS

SCB announces its first annual program of grants to support student research in field botany, e.g. floristics, taxonomy, ecology. Both graduates and undergraduates arc encouraged to apply. The amount of an award varies but connot exceed $200.00 A limitcd number of proposals can be funded. Grants may cover expendable items (gasoline, film, etc.) not otherwise available to the student.

Proposals containing the following information will be considered:

1. Description of proposed research, primary objectives, and relationship of the research to the students goals (two page limit).

2. Timetable for research: anticipated commencement and completion dates.

3. Budget, with justifications, and statement regarding availability of funds from other sources.

4. Brief resume stating current position, education, affiliations, qualifications and anticipated position and address at completion of research.

5. A letter of rccommendation from a faculty member. (may be sent separately to the the Student Research Crants Committee).

Three (3) copies of the proposal should be submitted before 10 Decmeber, 1981 to:

Student Research Grants Committee
Southern California Botanists
Rancho Santa Ana Botanic Garden
1500 N. College Avenue
Claremont, California 91711

SCB will publish the results of the research in its journal, Crossosoma. Awardces will provide SCB by 30 September, 1982, a formal rcport of the research completed, in a format suitable for publishing.

* * * * *

BOTANICAL BOOKS AVAILABLE

SCB maintains a substantial stock of books for sale at a 10% discount to members. We have technical and popular books, including many floras.

Write: SCB Booksales, care of Cardncr
777 Silver Spur Road (Suite 111)
Rolling Hills Estates, California 90274

POTLUCK DINNER

Saturday, October 10, 1981 at 6 P.M.

This dinner will again be at Rancho Santa Ana Botanic Garden, 1500 North College Avenue, Claremont, California. It's north of Foothill Boulevard and east of Indian Avenue. Drive to the upper parking lot.

Dr. Frits Zeylemaker, our Treasurer, will show us slides of South Africa. He was, for several years, Professor of Botany at the University in Basutolan (now Lesotho).

If your name starts with the following letters, you bring: A-F Main Dish, G-M Desserts, N-Z Side Dish (Vegetables, Salad, etc.). Bring your own table service. SCB will provide bread, butter, and beverages. Please come! This is always a most enjoyable evening.

* * * * *

VOLUNTEERS FOR SCB

(Repeat announcement by popular request)

SCB is managed, governed and operated by volunteers, who in addition to their time, contribute such costs as travel, telephone, secretarial, etc., etc. The Directors contribute about four (4) hours per month and travel up to 75 miles for monthly director's meetings. Book sales are time-consuming. Publishing Crossosoma requires about two (2) days of work for each issue, searching for articles, editing, typing, proofing, pasting and work with the printer and the mailer. Field trips require planning, plant lists, etc.

We need help! The present crew must have new support and replacements. For some, it's a labor of love. It really is gratifying work! For others, it's a small compensation for the many benefits received each year from SCB.

So examine your talents and your conscience, and let your President know what you will do. Write an article or note for Crossosoma. Get someone else to do so. Help at book sales. Proof read. Lead a field trip to some place special to you, or suggest one. You name it, and write Marvin M. Chesebro, 510 West 6th Street, Suite 523, Los Angeles, California 90014.

* * * * *

Crossosoma is published bi-monthly (February, April, June, August, October and December) by Southern California Botanists, a non-profit association. Dues are on a calendar year basis. Regular $6.00. Students and Retirees $4.00. Groups $10.00. Those joining for the first time after October 1, 1981 are credited with 1982 dues paid in full.

COMING 1981 EVENTS

October 10. (Saturday)	SCB Annual Pot Luck Dinner. Rancho Santa Ana Botanic Garden, 6 P.M.
October 24. (Saturday Noon)	Symposium. Cactus and Succulents, California State University Fullerton, 9:30 A.M.
November 7. (Saturday)	Rancho Santa Ana Botanic Garden fall plant sale. 8 A.M. at the Garden, 1500 North College Avenue, Claremont, California.
November 14. (Saturday)	Tour of Huntington Botanical Gardens with James Bauml, Botanist. San Marino, California, 9:30 A.M.

SOUTHERN CALIFORNIA BOTANISTS

Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711

CROSSOSOMA

SOUTHERN CALIFORNIA BOTANISTS
Rancho Santa Ana Botanic Garden, Claremont CA. 91711

Crossosoma Vol. 7, No. 6 December, 1981
Editor: M. Chesebro

HYBRIDIZATION BETWEEN PINYON SPECIES

By

Trudy R. Ericson

Various studies and reports of natural hybridization between pine species have been conducted (Armstrong, 1977; Critchfield, 1977; Haller, 1962; Zobel, 1951). This study was initiated to investigate the possibility of natural hybridization between Pinus quadrifolia and Pinus monophylla in southern Riverside County where the two species occur together and/or in close proximity.

Fifteen species of pines occur in southern California, of which three are classified as pinyons. Only two of the three pinyons occur in any great number: Pinus quadrifolia Parl. ex Sudw. and Pinus monophylla Torr. & Frem. (Munz, 1974).

P. quadriolia (Parry's Pine) is confined in a narrow strip some 220 miles long in southern California and Baja California. The bulk of the population in California is in Riverside County. It starts in the Santa Rosa Mountains and runs northwestward to Thomas Mountain and the head of Bautista Canyon (Griffin and Critchfield, 1972).

P. monophylla (single leaf pine) ranges throughout the Great Basin region, south to southern California and Baja California. In southern Fiverside County and San Diego County it is replaced to a large extent by P. quadrifolia with little overlap (Griffin & Critchfield, 1972).

However, in that portion of the Santa Rosa Indian Reservation which lies north of St. Hwy. 74, there are a few specimens of P. monophylla growing sympatrically with P. quadrifolia. Approximately three miles west of Alpine Village a large forest of P. monophylla begins.

The entire area is densely covered by typical, highly combustible chaparral species (Hanes, 1971) and it is quite possible that the two forests were contiguous at one time, but since that time have been separated by fire. Contiguousness is not a necessity for hybridization, for the species are still well within pollen exchange distances.

The pines are all wind pollinated and noted for the vast quantities of pollen they shed and the great distances it may be carried by air currents (Wodehouse, 1959). The viability of pine pollen is maintained much longer than in many other species, e.g., grass pollen has the shortest life span under natural conditions.

Although 20 characters were studied to differentiate between the parental species, only 10 were significant in analyzing the relationships between the two species. These were selected on the basis of how well each characteristic delimited the parental species.

The most obvious distinguishing characteristic between the two taxa is leaf morphology. The needles of P. quadrifolia are dark blue-green in color with conspicuous rows of stomata on the inner surfaces, occur for the most part in bundles of 4 (although on any given tree the number per fascicle may vary). The needles are shorter, narrower and more flexible than those of P. monophylla.

In contrast the needles of P. monophylla are pale gray-green with no conspicuous stomatal rows, are strongly incurved, stiff and rigid and end in an abrupt, sharp prickly tip, and usually occur singly.

Color of the male strobili was significant. At the time of pollen shedding, the strobili of P. quadrifolia were rosy-pink and those of P. monophylla yellow-brown; those of the hybrid differed very little from P. quadrifolia.

The female cones of P. quadrifolia were smaller than those of P. monophylla, both in size and weight, while the hybrids occupied an intermediate range.

Seed measurements differed considerably between the three groups, those of P. monophylla being much larger; those of the hybrid were intermediate.

Close examination of significant data and graphic portrayal of results clearly indicated differences among the three groups and at the same time depicted a greater affinity between P. quadrifolia and the hybrid. This affinity could be explained by the fact that in the one area where the parental types grow sympatrically, there is a preponderance of P. quadrifolia, and the

hybrids were only found in this area, occupying the perimeters of the forest. The relationship between P. quadrifolia and the putative hybrid can be explained by the mechanics of the pollination and seed dispersal systems. The overwhelming abundance of locally produced pollen by P. quadrifolia and the hybrid would effectively negate any opportunity of pollination by P. monophylla. Because of the close proximity of the two populations pollen exchange would be highly favored, resulting in a considerable amount of backcrossing and the production of a population more nearly alike than different.

Seed dispersal is accomplished by wind, gravity, birds, rodents, etc. This seed supply is considerably reduced by fungi and the above biotic agents which depend upon seeds as a source of food. Therefore, widespread dispersal is minimum and wind and gravity become the important agents; seeds generally then alight near the parent tree.

Therefore, it would seem on the basis of this study that some natural hybridization has occurred and the resulting hybrid is more closely related to P. quadrifolia than to P. monophylla.

---

* Based on M. A. Thesis by T. R. Ericson, on file in CSUF Library.

LITERATURE CITED

Armstrong, Wayne P. 1977. Natural Plant Hybrids in San Diego County. Environment West, San Diego Society of Natural History. No. 477.

Critchfield, William B. 1977. Hybridization of Foxtail and Bristlecone Pines. Madrono 24(4):193-212.

Criffin, James R. and William B. Critchfield. 1972. The Distribution of Forest Trees in California, USDA Forest Service Research Paper - PSW 82/1972, Stock No. 0101-0243, Supt. of Documents, I. S. Covernment Printing Office, Washington, D.C. 20402. 114 pp.

Haller, John R. 1962. Variation and Hybridization in Ponderosa and Jeffrey Pines. University of California Publications in Botany 34:122-162.

Hanes, Ted L. 1971. Succession after Fire in the Chaparral of Southern California. Ecological Monographs Vol. 41:27-52.

Munz, Philip A. 1974. A Flora of Southern California. Univ. of Calif. Press, Berkeley and Los Angeles, CA, 1086 pp.

Wodehouse, R. P. 1959. Pollen Grains. Their Structure, Identification and Significance in Science and Medicine. Hafner Publishing Co., New York, N.Y. 574 pp.

Zobel, Bruce. 1951. The Natural Hybridization between Coulter and Jeffrey Pines. Evol. 5:405-413.

Pinus quadrifolia Parry.

Pinus monophylla Torr. & Frem.

* * * * *

HALL CANYON RESEARCH NATURAL AREA (RNA) PROPOSAL

The San Bernardino National Forest is preparing a Forest Land Management Plan. The University of California is requesting that lands adjacent to the James San Jacinto Mountains Reserve, near Idyllwild, be designated a Research Natural Area (RNA). This area (Hall Canyon) is noted for its relatively undisturbed Mixed Conifer-Oak Forest. Coulter, Ponderosa, and Sugar Pines, Incense-Cedar, White Fir, Canyon Live Oak and California Black Oak form the overstory. An unusual association borders a clear mountain stream, including White Alder, Western Azalea (Rhododendron occidentale), Burning Bush (Euonymus occidentalis), Lemon Lily (Lilium parryi), and a variety of ferns (Athyrium felix-femina, Pteridium aquilinum, and Woodwardia fimbriata). Spotted Owls are resident and a pair successfully fledged two young this year.

RNA designation is necessary to protect the ecosystem from consumptive uses (logging, developed recreation, etc.,) and preserve the quality of teaching and research carried on in the area. Logging has occurred in Spotted Owl habitat in each of the last two years. The James Reserve is only 30 acres so visitors use the adjacent Forest lands. Of the nearly 10,000 visitor hours last year at the James Reserve, over half was by users other than the University of California. SCB has visited the Reserve.

Letters are needed to show that RNA designation would serve the public. Send your letter supporting RNA designation for Hall Canyon to

C. Douglas Pumphrey, District Ranger, USFS, P.O. Box 518
Idyllwild, California 92349

Cut here, remove and mail separately.

DUES FOR 1982 ARE NOW DUE

Individual (including family)	$ 6.00	/__/
Student or Retired	4.00	/__/
Organization	10.00	/__/

Please check your status and mail this form and your check today.

SCB relies on dues to finance printing and mailing Crossosoma, the symposium, publications, etc. We appreciate your support and welcome all suggestions and help.

Many members are not sure of their dues status. Check your address label. If "'81" appears on the label, you are current to date and need only send 1982 dues. If only "'80" appears, we have no record of receiving 1981 dues and would appreciate including this in your check, since we have sent you all 1981 issues, etc.

We plan another active and interesting program for 1982.

Name_____

Address_____

City_____Zip Code_____

Phone(_____)_____

Make check payable to: SOUTHERN CALIFORNIA BOTANISTS.
Mail check and this form separately to:

SOUTHERN CALIFORNIA BOTANISTS
1500 North College Avenue
Claremont, California 91711

* * * * *

BOOK REVIEW

TREES AND SHRUBS FOR DRY CALIFORNIA LANDSCAPES - PLANTS FOR WATER CONSERVATION. By Bob Perry. 184 pages, hardback. Illustrated with color photographs. Land Design Publishing, San Dimas, California. September 1981. $28.50.

This book is a treasure of information on selecting and using plants for dry landscapes in California. Its timely appearance coincides with the growing public awareness that our water resources are limited and that our gardens and surrounding urban landscapes must accommodate to this increasingly serious problem. In using this book the reader must first identify the particular plant region in which he is located. Native and introduced plants are then recommended for each region. This is followed by considerations and procedures for planting. There are lists of plants for different landscape purposes and a compendium which comprises the bulk of the book. The text of each compendium entry consists of a brief description and comments. Most of the over 500 photographs accompany the compendium entries.

Identification of a particular regional plant environment (as coastal, inland valley, inland foothill, etc.) is done by consulting maps of California. Each regional plant environment is discussed as to climate and other conditions important in achieving proper landscapes. A series of tables list the plants most suited for each regional plant environment. The guidelines for planting drought resistant plants include topics on planting from containers from seeds, on slopes, for fire safety, etc. The emphasis is on establishing new plantings. There is no heading for general problems one might encounter in established plants such as how to treat overgrown plantings, should they be replanted or pruned, and if the latter how and when. I also wonder if there are any particular problems common to established plants of dry landscapes. The compendium however, does supply some answers on maintenance as they apply to specific plants.

There is a section which list plants for particular landscape situations. There are lists of plants resistant to oak root rot, plants tolerant of alkali soil, saline soil, clay soil, etc. It might have been handy to have a list of plants noted for color and the season in which the color appears. But again, if one looks through the compendium this information can be located.

In the last section, the Plant Compendium, plants are listed by their species name with each entry accompanied by a brief des-

cription and pertinent comments, mainly on landscape use. There are two photographs in color for most plants listed. One photograph shows the general growth habit of a mature plant and the second shows a closeup of the plant's highlights, usually the flowers, and sometimes the fruit or foliage. The photographs have been carefully chosen to enable the reader to readily determine the landscape suitability of a particular plant. The compendium text and photographs are so arranged as to be on the same page or on the opposite page, thus providing quick easy reference from text to picture or vice versa.

The profusion of colored photographs, the wealth of practical information and the inclusion of native and introduced plants make this a most helpful guide for the home landscaper and an excellent reference book for the professional landscaper. For the person who is interested in identifying dry landscape plants, many of the photographs are detailed enough to enable one to recognize and name the plants along urban freeways when the traffic slows. The goals of this book, as cited by the author, are to provide information and illustrations that will help Californians achieve successful landscapes within the limits of water conservation. I believe the author has done an admirable job in meeting these objectives.

Barbara Joe Hoshizaki

* * * * *

WILD MUSHROOM CONFERENCE
Feb. 12 - 15, 1982

The Los Angeles Mycological Society is conducting its Third Annual Conference in February 12 through 15, 1982, at California State University at Los Angeles.

The program participants are:

David Arora: Author of Mushrooms Demystified; Santa Cruz. California

David F. Farr: Research mycologist with the Mycology Laboratory, U.S. Dept. of Agriculture; Beltsville, Maryland. Author (with Orson Miller) of An Index of the Common Fungi of North America.

David T. Jenkins: Professor, Department of Biology, University of Alabama at Birmingham; Birmingham, Alabama, Author of Mushrooms - A Separate Kingdom. Authority on the genus Amanita.

Richard Kerrigan: Graduate student of Harry Thiers at San Francisco State University. Interests: the genus Agaricus and mushroom cultivation; Santa Cruz, California.

Orson K. Miller, Jr.: Professor of Biology, Virginia Polytechnic Institute; Blacksburg, Virginia. Author of Mushrooms of North America and Mushrooms in Color.

EVENTS

January 24, 1982, Sunday 1:00 P.M. Algal tide pool walk. Whites Point, off Paseo Del Mar, San Pedro. Park at top (save $3.00 parking fee), Meet at bottom of access road.

February 12 -15, 1982, Wild Mushroom Conference at Cal State Los Angeles

SOUTHERN CALIFORNIA BOTANISTS

Rancho Santa Ana Botanic Garden
1500 North College Avenue
Claremont, CA 91711